U.S. Department of Energy
Energy Efficiency and Renewable Energy

Department of Energy Resources to Make Paper Mills More Energy Efficient

"Paper Industry Energy Symposium"
Lakes States TAPPI meeting
Appleton, Wisconsin
March 15, 2005

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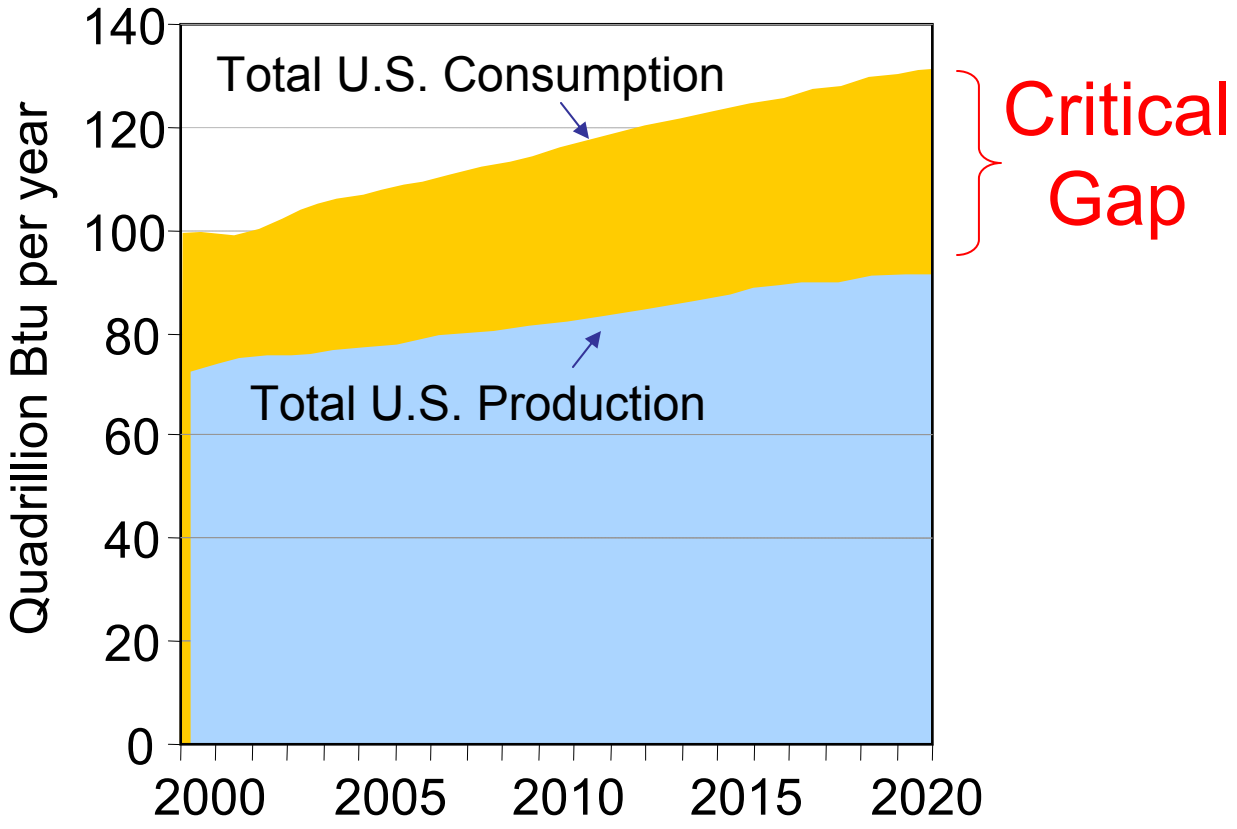
Overview

- Big Picture of US Energy Situation
- DOE Industrial Technologies Program Strategy
- Industrial Energy Efficiency Opportunity
- DOE Resources to Tap Into
- Future Directions in Forest Products Industry Outreach

Big Picture of US Energy Situation

Projected Energy Use

Total U.S. Energy Production vs. Consumption, 2000-2020

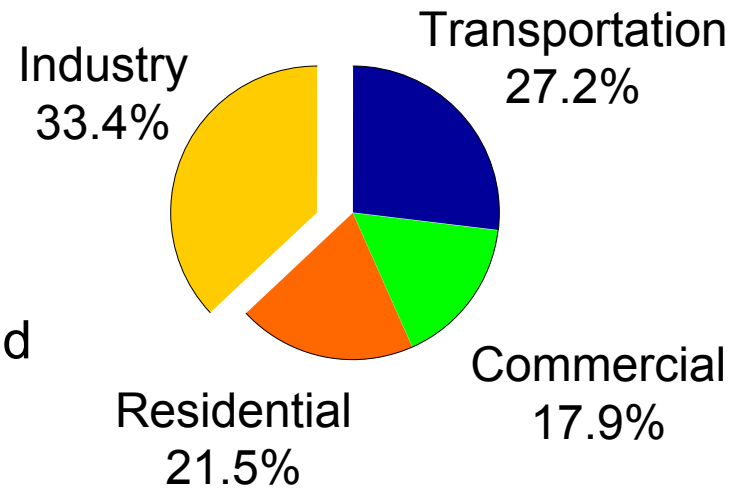


Source: Energy Information Administration projections

Industry: Critical to National Energy Policy

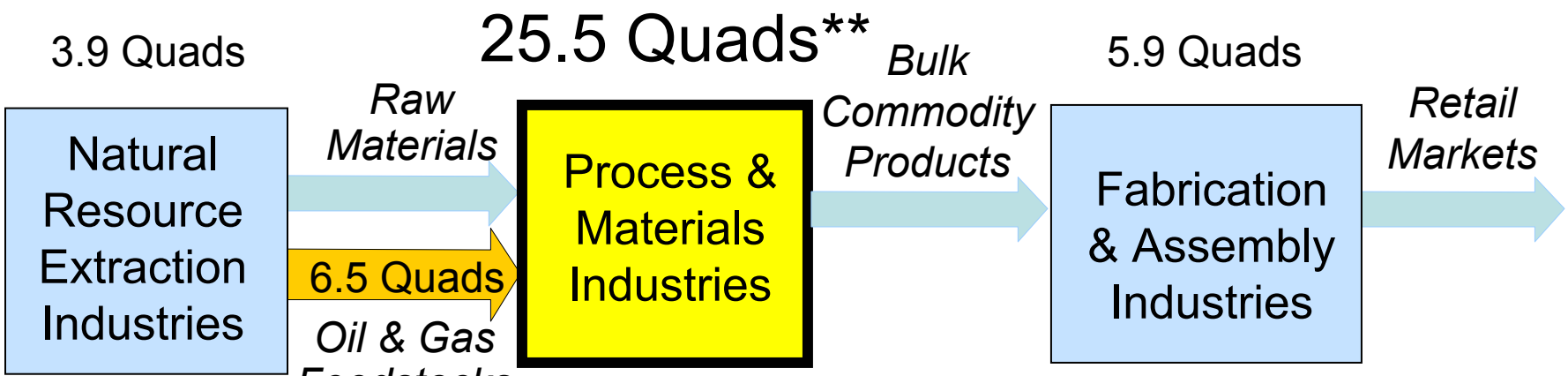
- Uses more energy than any other single sector; >1/3 of U.S. **energy consumption**
- Produces approximately 30% of U.S. **greenhouse gas** emissions
- Accounts for more than 35% of U.S. **natural gas** demand
- Accounts for 28**%** of U.S. electricity demand
- Energy is key to **economic growth** in domestic manufacturing

2002 Energy Use



- "Many companies have been unable to pass higher energy costs on to their customers, which has sharply reduced their profit margins" *National Energy Policy, pages 2-4*

Heavy Energy Use in Process Industries*



Mining
Forestry
Farming
Oil & Gas Extraction

Chemicals
Paper & Wood (4.0)
Metals
Non Metallic
Petroleum Refining
Food Processing

Plastics
Fabricated Metal Products
Transportation Equipment
Machinery
Computer & Electronic Products
Electrical Equipment
Printing
Construction

* 1998 estimates based primarily on MECS and AER data
Includes electricity generation, transmission, and distribution losses
** Includes 6.5 Q oil & gas feedstocks

DOE Industrial Technologies Program Strategy

Industrial Technologies Program

MISSION

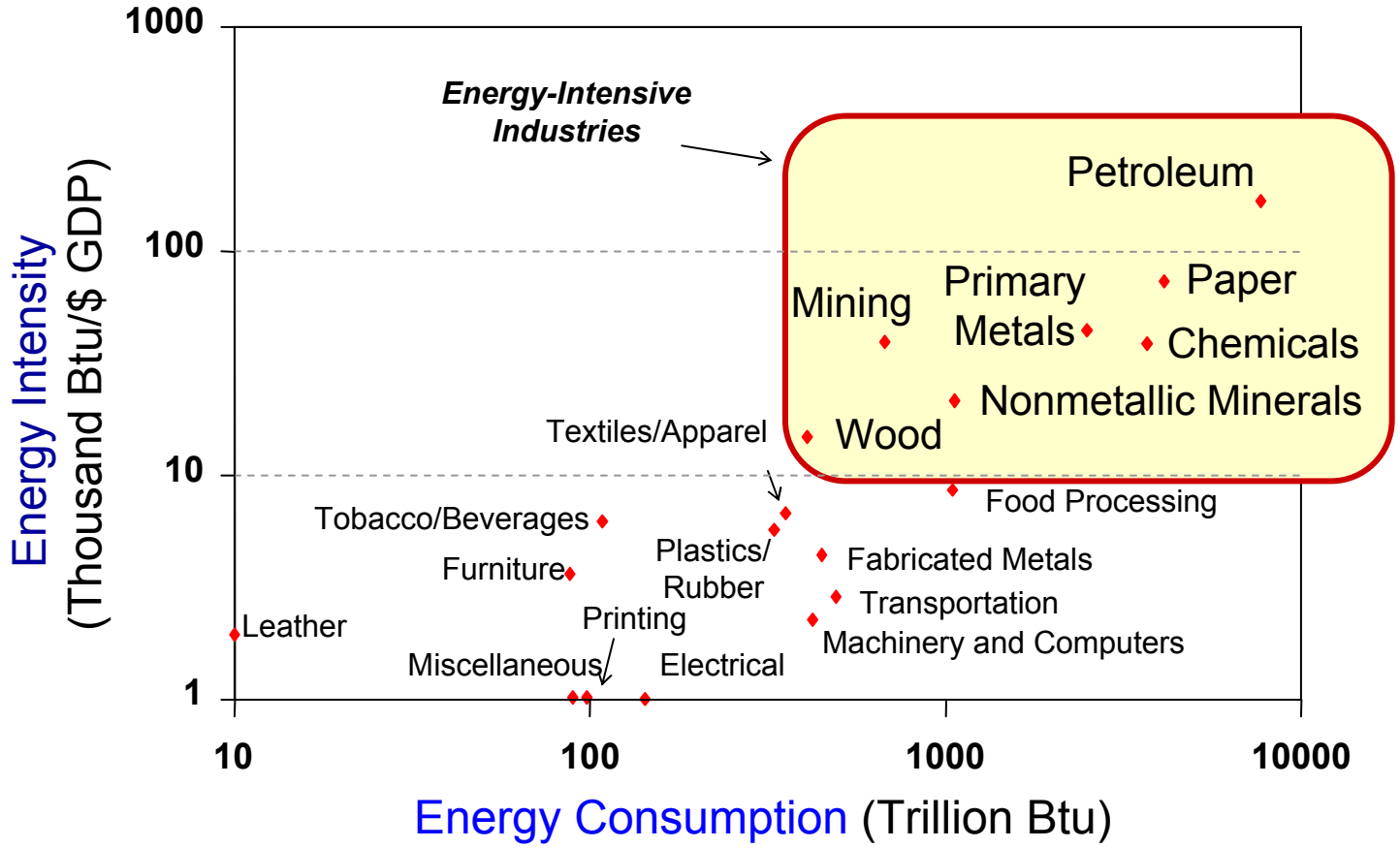
Improve the energy efficiency of U.S. industry through coordinated **research and development, validation, and dissemination** of innovative technologies and practices.

Partner with industry and other stakeholders to

- Save energy
- Improve productivity
- Reduce reliance on foreign oil
- Reduce environmental impacts

Focus: Major Energy-Intensive Industries

Industrial Energy Intensity vs. Energy Consumption



Sources: EIA 2001, 1998 Manufacturing Energy Consumption Survey; U.S. DOE 2002, Energy and Environmental Profile of the U.S. Mining Industry

Delivering Technology Solutions

Collaborative R&D

- Energy-intensive Process Technologies
- Crosscutting Technologies

Partnerships

Technology Delivery

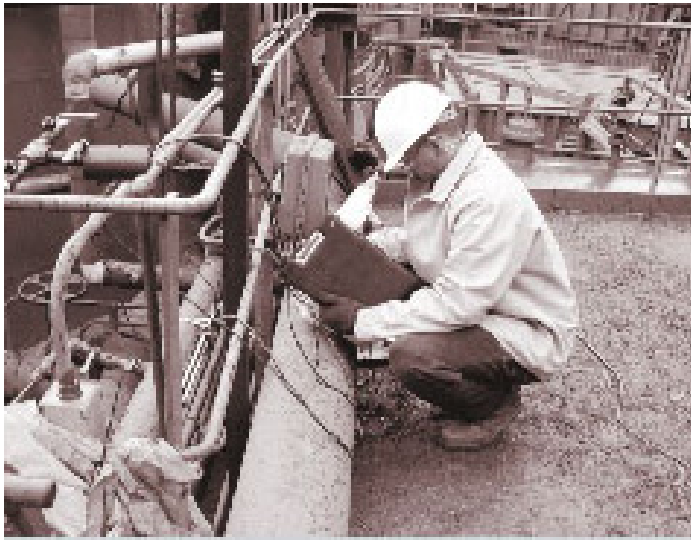
- Assessments
- Training & Tools
- Technology Demonstrations

Industrial Energy Efficiency Opportunity

Plant-Wide Assessments

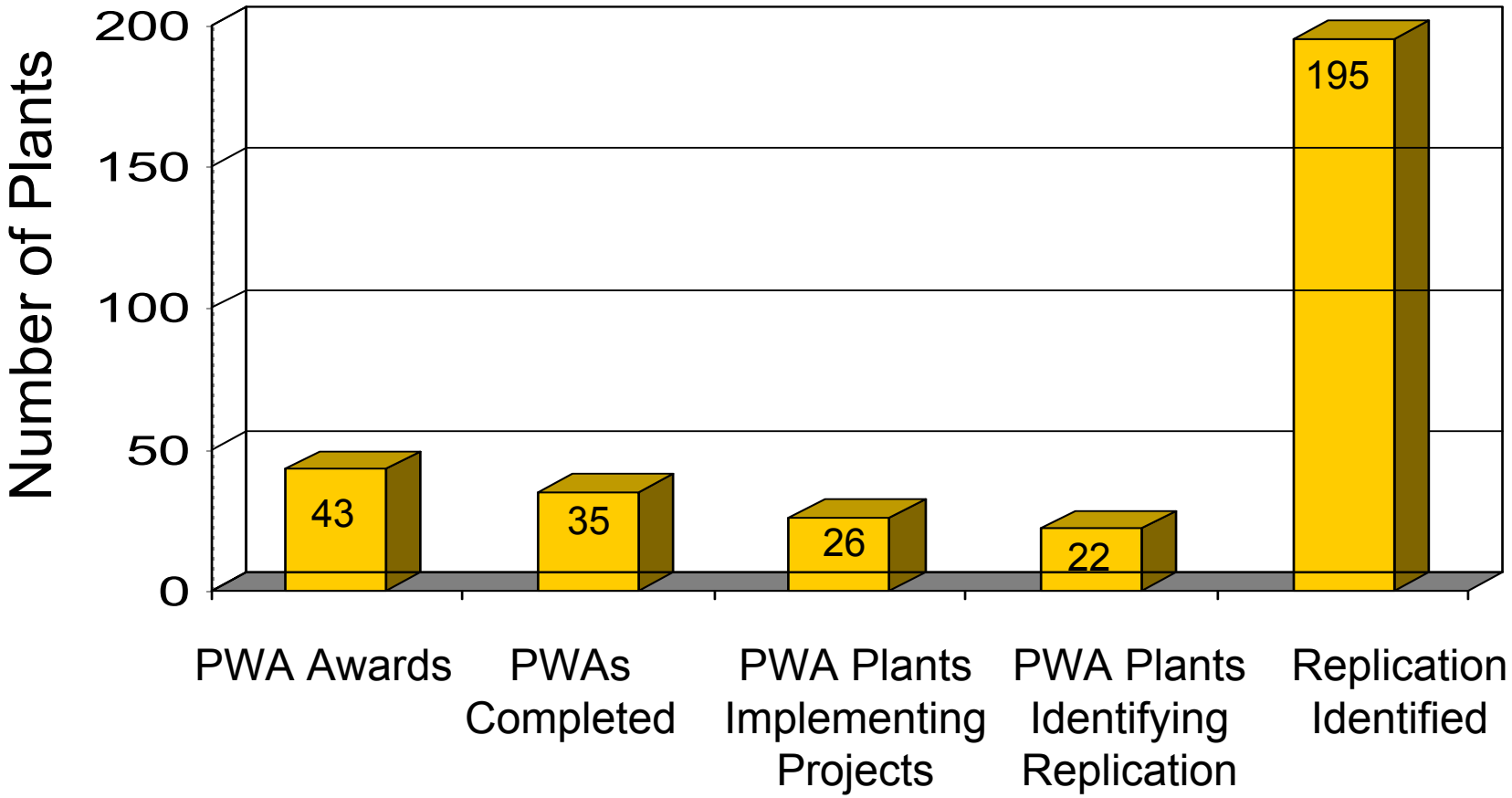
Cost-shared assessments to identify opportunities for energy and cost savings:

- Up to $100,000 competitively awarded through an open solicitation process
- Summary case study published to promote replication
- Proprietary Information fully protected

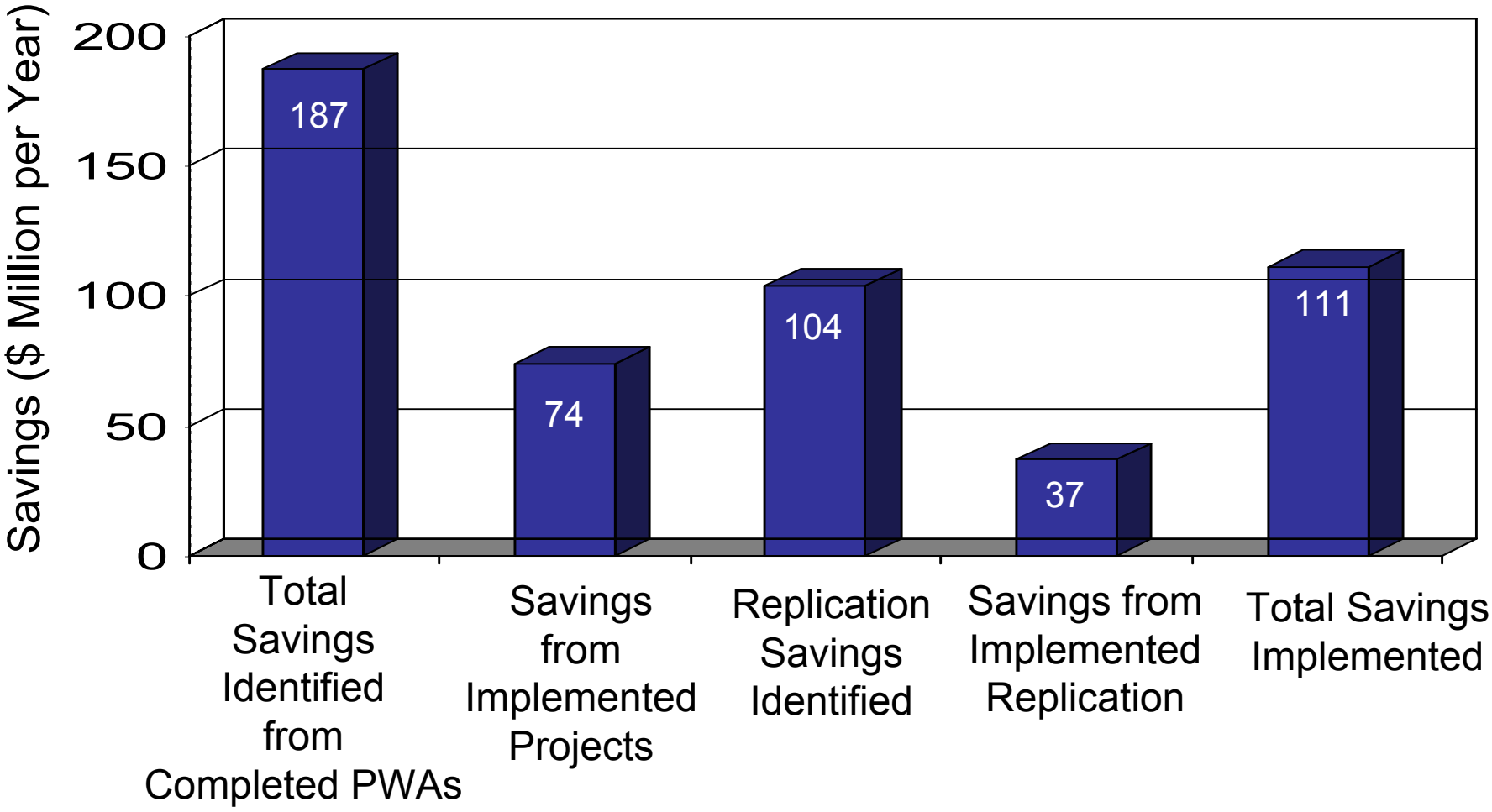


See www.oit.doe.gov/bestpractices/plant_wide_assessments.shtml

PWA Activities Through FY04



PWA Savings Through FY04



Forest Products Case Studies

Plant	Location	Annual Savings Identified in PWA	Case Study Web Address
Appleton Papers, Inc	West Carrollton, OH	$3.5 million	www.oit.doe.gov/bestpractices/factsheets/newapple.pdf
Augusta Newsprint	Augusta, GA	$1.6 million	http://www.oit.doe.gov/bestpractices/factsheets/fp_cs_augusta_newsprint.pdf
Blue Heron	Oregon City, OR	$2.9 million	www.oit.doe.gov/bestpractices/factsheets/fp_cs_blue_heron.pdf
Boise Cascade	International Falls, MN	$707,000	www.oit.doe.gov/bestpractices/factsheets/boise.pdf
Caraustar	Rittman, OH	$1.2 million	www.oit.doe.gov/bestpractices/factsheets/caraustar.pdf

Forest Products Case Studies (cont.)

Plant	Location	Annual Savings Identified in PWA	Case Study Web Address
Georgia-Pacific	Palatka, FL	$2.9 million	www.oit.doe.gov/bestpractices/factsheets/fp_cs_georgia_pacific.pdf
Georgia-Pacific	Crossett, AK	$9.6 million	www.oit.doe.gov/bestpractices/factsheets/fp_cs_georgia_pacific_crossett.pdf
Inland Paperboard	Rome, GA	$9.5 million	www.oit.doe.gov/bestpractices/factsheets/inlandpaper.pdf
Weyerhaeuser	New Bern, NC	$2.9 million	Case study not complete
Weyerhaeuser	Longview, WA	$3.1 million	www.oit.doe.gov/bestpractices/factsheets/fp_cs_weyerhaeuser.pdf

Targeted Assessment Results

Summary of Results Through FY 03			
System	**No.**	**Annual Identified Energy Savings**	
		Medium	**Range**
Pumps	23	$148,000	$13,000 - $2.0 Million
Process Heating	13	$1,207,000	$170,000 - $2.1 Million
Steam	15	$225,000	0 – 1.6 Million
Compressed Air	18	$145,000	$12,000 - $270,000
Insulation	5	$540,000	$13,000 – 1.1 Million
Total	84		

DOE Resources To Tap Into

Tools Available on Our Web Site or via Links

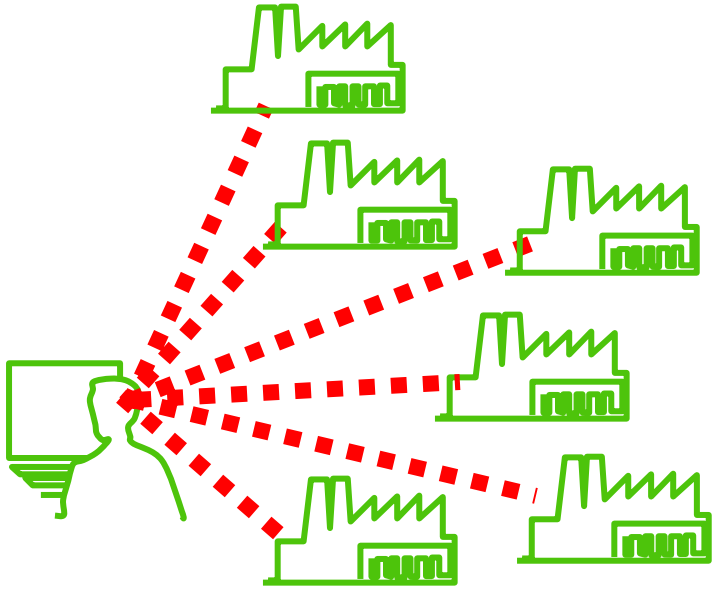
- **Motor Master +** Assists in energy-efficient motor selection and management.
- **Pumping System Assessment Tool** Assesses the efficiency of pumping system operations.
- **Steam System Scoping Tool** Profiles and grades large steam system operations and management.
- **Steam System Assessment Tool** Assesses potential benefits of specific steam-system improvements.
- **Air Master+** Provides comprehensive information on assessing compressed air systems.
- **3EPlus Insulation Assessment Tool** Calculates most economical thickness of insulation for a variety of operating conditions.
- **ASDMaster** Determines economic feasibility of an ASD application.
- **Process Heating Assessment and Survey Tool** Assesses energy use in furnaces and identifies ways to improve performance.

See http://www.oit.doe.gov/bestpractices/software_tools.shtml

Qualified Specialists

DOE and its Allied Partners certify Qualified Specialists to apply energy management decision tools at industrial facilities to analyze:

- **Compressed Air Systems**
- **Pump Systems**
- **Steam Systems**
- **Process Heating Systems**
- **Fan Systems** (2004)

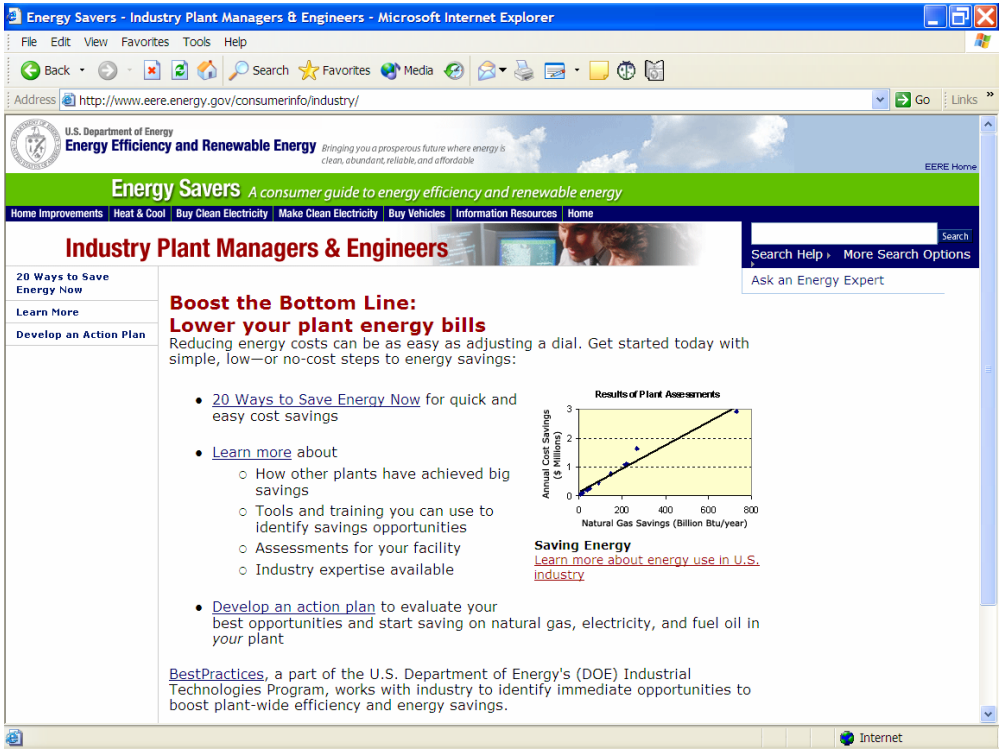


Each new qualified specialist contributes to increased energy and cost savings

See http://www.oit.doe.gov/bestpractices/software_tools.shtml

Industrial Energy Savers Website

- 20 Best Ways to Save Energy Now
- Learn How Others Have Saved
- Develop an Action Plan
- Access the National IAC Database



www.energysavers.gov/industry

Possible Action Steps

- Call the Information Center for information and ideas
- Visit websites for tips, information, what others are doing:
  - www.eere.energy.gov/bestpratices
  - www.energysavers.gov/industry
- Send plant personnel to take training
- Encourage plant personnel to become qualified specialists in DOE software tools
- Contract with a qualified specialist to assess energy savings opportunities
- Submit application to DOE for a plant-wide assessment
- Replicate results/methodologies from other plant-wide assessments
- Request an Industrial Assessment Center audit

American Forest & Paper Association (AF&PA) and DOE Outreach Campaign

- Formed Energy Efficiency committee composed of paper company Energy Managers
- Will develop outreach strategy to all levels of paper company employees – CEO to mill staff
- To be introduced to decision makers at Paper Week in April
- Energy Efficiency Workshop being planned for Fall 2005

Resources for Your Plant and Company

- Energy analysis software tools
- Case studies and information
- Energy efficiency training for plant staff
- Qualified specialists
- DOE-supported energy assessments

Call: **877-337-3463**

Websites: **www.eere.energy.gov/bestpractices**
www.energysavers.gov/industry

Plant-wide Assessment Impact

Inland (Paperboard & Packaging)

31 energy-saving opportunities identified including:

- Replace two existing mechanical drive steam turbines on No. 2 paper machine with variable speed motor drives
- Reduce water and steam use at paper machine and support systems
- Rebalance steam distribution system

Plant-wide Assessment Impact

Inland Results

$9.5 M/yr cost savings

Energy savings

- 21,600,000 kWh/yr
- 2,900 MMBtu/yr

6-month payback

$4.5 M initial capital requirement

- Reduced air emissions
- Decreased water, steam, and electricity usage

Plant-wide Assessment Impact

Caraustar (Recycled Paperboard)

Several steam and motor projects identified at the Rittman, OH plant:

- Motor procurement and efficiency improvements
- Backpressure steam turbine generators
- Boiler feed pump VSDs
- Stack heat recovery to vapor absorption systems
- Pulper fill-water heat exchangers
- Steam pipe insulation

Plant-wide Assessment Impact

Caraustar Results

$1.2 M/yr cost savings
11,000,000 kWh/yr energy savings
4-month to 2.5-year payback
$3 M initial capital requirement

- Reduced air emissions
- Corporate procurement program developed for purchase of power transmission and electrical equipment from a single source

Plant-wide Assessment Impact

Boise Cascade (Pulp & Paper)

Assessment identified four projects and two process modifications at International Falls, MN, mill:

- Conserve base mill water
- Reroute turbine room steam trap condensate
- Use foul condensate heat for demineralized water makeup to hotwells
- Modify selected processes to decrease effluent flow and energy consumption

Plant-wide Assessment Impact

Boise Cascade Results

$707,000/yr cost savings

Energy savings:

2,650,000 kWh/yr

2,300 MMBtu/yr

3-year payback

$2.1 M initial capital requirement

- Reduce heat load by 45 million Btu/hr
- Reduce steam use by 28,100 lb/hr
- Reduce effluent flow by 2.2 mgd

Plant-wide Assessment Impact

Appleton Papers (Pulp & Paper)

Assessment identified 21 projects at West Carrollton, OH mill:

- Recover heat from paper machine vents
- Recover fiber from low-consistency screen rejects
- Install oxygen and carbon monoxide monitoring equipment to control boiler combustion
- Reuse uhle-box water
- Reduce silo temperatures
- Add a fluidized bed boiler

Plant-wide Assessment Impact

Appleton Papers Results

$3.5 M/yr cost savings
Energy savings:
    4,800,000 kWh/yr
    150,000 MMBtu/yr
Payback period of ~1.2 years/project
$2.5 M initial capital requirement

- Decreased waste disposal costs
- Increased paper production
- A project to install a fluidized-bed boiler would result in another $2.6 M/yr savings

Plant-wide Assessment Impact

Georgia Pacific (Kraft and Tissue)

Assessment identified two water reduction projects and eight heat recovery projects at Palatka, FL, to save steam and natural gas, including:

- Demineralized water heating
- ClO2 filtrate heating
- ClO2 heating
- TPM combustion air preheating
- Alternative to Project 12
- White water heating
- Vapor take-off
- Reflux condenser rework

Plant-wide Assessment Impact

Georgia Pacific Results

$2.9 M/yr cost savings

729,000 MMBtu/yr energy savings

2.5-yr payback

$7.7 M project capital cost

- Reduce water use by 2,100 gpm
- Cogeneration opportunities also identified

Plant-wide Assessment Impact

Weyerhaeuser (Pulp & Paper, Newsprint)

Assessment identified process configuration changes and heat recovery projects at Longview mills:

- Improvements concentrated in fiber line washing efficiency and evaporation plant steam economy
- Cogeneration opportunities also identified

Plant-wide Assessment Impact

Weyerhaeuser Results

Cost savings: $3.1 million

Energy savings: 1,800,000 MMBtu

Initial capital requirement: $5 - 11 million

- Reduce water consumption by 3,600 gpm

Plant-wide Assessment Impact

Blue Heron (Pulp & Paper, Newsprint)

Assessment identified process configuration changes and heat recovery projects:

- Close vacuum pump seal water loop and heat shower water
- Recover heat from vacuum pumps, Uhle boxes, and TMP wastewater
- Heat shower water with reboiler steam and vacuum pump seal water

Plant-wide Assessment Impact

Blue Heron Results

Cost savings: $2.9 million

Steam savings: 500,000 MMBtu

Initial capital requirement: $6.3 million

- Reduced heat load in effluent
- Reduced environmental emissions